

Listing of Claims

1. (currently amended) A method for analysis of physiological or health data in at least two levels of detail, said method comprising:

analyzing at least one of a plurality of primary elements in said data in first scale, low level resolution to detect one-time changes in such primary elements and thereby identify any abnormal or unstable primary elements ~~and representing deviation of primary elements from the reference values in a form understandable to a lay person;~~ by comparing said primary elements with at least one reference value for said at least one of a plurality of primary elements;

analyzing said at least one of a plurality of ~~some of the same~~ said primary elements in said data in a second scale, higher level resolution using at least one of the following methods selected from mathematical decomposition, time-series analysis, mathematical modeling, computer modeling, signal processing, statistical analysis, and methods of artificial intelligence, and a combination of mathematical decomposition with methods or artificial intelligence to provide detailed characterization of serial changes in said abnormal or unstable primary elements; and

exchanging information between said analyzing in said first and second levels of resolution to improve at least one of said first and second analyses.

2. (currently amended) A method as set forth in claim 1 in which said analyzing a plurality of primary elements in said data in first-scale low resolution is selected from a at least one of mathematical decomposition, mathematical modeling, computer modeling, time-series analysis, signal processing, statistical analysis, and methods of artificial intelligence.

3. (currently amended) A method as set forth in claim 1 in which analyzing said data to provide detailed characterization of serial changes in said

abnormal or unstable primary elements is performed using at least one of the following methods selected from orthogonal decomposition, non-orthogonal decomposition (independent component analysis), multidimensional scaling based on non-metric distances and mapping techniques, non-orthogonal linear mappings, nonlinear mappings and other methods, that make use of projection, re-scaling (change of variables), methods from the theories of singularities, bifurcations, catastrophes, and dynamical systems, and other statistical estimators, ~~such as~~ linear and nonlinear correlation, analysis of variance, cluster analysis, factor analysis, canonical analysis, regression and discriminant function analyses, and probabilistic methods, ~~such as~~ Bayesian probability and Mahalanobis distance, pattern recognition, fuzzy logic, neural networks, expert systems, and hybrid artificial intelligence systems.

4. (original) A method as set forth in claim 1 in which analyzing said data to provide detailed characterization of serial changes in said abnormal or unstable primary elements is selected from a fuzzy-logic classifier and a dynamic neural network with at least one neuron (unit) analyzing changes in at least one state of activity of at least one physiological, biochemical, biophysical, mechanical, and genetic system relative to at least one reference value.

5. (original) A method as set forth in claim 1 in which said reference values are represented by a relation (function, distribution) between said reference values and at least one state of at least one physiological, biochemical, biophysical, mechanical, and genetic system.

6. (currently amended) A method as set forth in claim 1, in which said analysis and representation are applied to physiological signals selected from at least one of ~~such as~~ blood pressure, cardiac output, vascular activity, temperature, respiration, cardiac, abdominal, or breathing sounds, blood flow, hormonal concentration, enzyme and protein level, genetic, proteomic, and molecular data, neural activity, electroencephalographic activity, and other electrical, mechanic,

sonic, biochemical, biophysical processes in the human body, demographic, psychological, and environmental data.

7. (currently amended) A system for detection of serial changes in physiological or health data and analysis in at least two levels of detail ~~for use by both lay persons and medical professionals~~, said system comprising:

at least one multiple acquisition unit ~~units connected to a network~~ for collecting physiological or health data from a subject over a period of at least several seconds;

at least one first analysis and processing unit for detecting at least one of a plurality of primary elements from said data and processing said primary elements in low level resolution to generate data respecting ~~time intervals or amplitudes of~~ said primary elements, ~~storing reference values of said primary elements~~, and comparing at least one reference value respecting said primary elements with data newly received by said first analysis and processing unit and producing ~~qualitative indicators and quantitative data~~ at least one indicator respecting any differences between said at least one reference value ~~recorded data~~ and said newly received data;

at least one storage unit for storing said at least one reference value respecting said primary elements, and

~~an output unit for displaying said qualitative indicators in form understandable by lay persons and quantitative data for medical professionals; and~~

a communications unit for sending data of said primary elements to at least one computer device ~~a network of computers~~ for processing and detailed analysis of serial changes in at least some of the said primary elements in said data, ~~said network of computers~~ for a higher resolution analysis using at least one of the methods selected from mathematical decomposition, mathematical modeling, computer modeling, signal processing, time series analysis, statistical analysis, and methods of artificial intelligence for assessing small changes in serial

data and for exchanging information with said first analysis and processing unit to improve at least one of said low-level and higher-level resolution.

8. (currently amended) A detection and analysis system as set forth in claim 7 which includes multiple first analysis and processing units connected to ~~a network~~ at least one computer device.

9. (currently amended) A detection and analysis system as set forth in claim 7 in which said first analysis and processing unit and said at least one computer device ~~network of computers~~ analyze said data to provide detailed characterization of serial changes in said abnormal or unstable primary elements using at least one of the following methods selected from orthogonal decomposition, non-orthogonal decomposition (independent component analysis), mathematical modeling, computer modeling, signal processing, time-series analysis, statistical analysis, multidimensional scaling based on non-metric distances and mapping techniques, non-orthogonal linear mappings, nonlinear mappings and other methods, that make use of projection, re-scaling (change of variables), methods from the theories of singularities, bifurcations, catastrophes, and dynamical systems, and other statistical estimators, ~~such as~~ linear and nonlinear correlation, analysis of variance, cluster analysis, factor analysis, canonical analysis, regression and discriminant function analyses, and probabilistic methods, ~~such as~~ Bayesian probability and Mahalanobis distance, pattern recognition, fuzzy logic, neural networks, expert systems, and hybrid artificial intelligence systems.

10. (currently amended) A detection and analysis system as set forth in claim 7 in which at least one of said first analysis and processing unit and said at least one computer device ~~network of computers~~ analyze other physiological data selected from at least one of ~~such as~~ blood pressure, cardiac output, vascular activity, temperature, respiration, cardiac, abdominal, or breathing sounds, blood flow, hormonal concentration, enzyme and protein level, genetic, proteomic, and molecular data, neural activity, electroencephalographic activity, and other electrical,

mechanic, sonic, biochemical, biophysical processes in the human body, demographic, psychological, and environmental data.

11. (original) A detection and analysis system as set forth in claim 7 in which said communication unit is wireless.

12. (original) A system as set forth in claim 7 in which said higher-level analysis is distributed among several computers connected via computer networks.

13. (original) A system as set forth in claim 7 in which said data acquisition and low-level analysis of health data are distributed among several personal devices, selected from noninvasive and implantable devices, which are connected via computer networks.

14. (original) A system as set forth in claim 7 in which said higher-level analysis of health data is performed using parallel processing.

15. (original) A system as set forth in claim 7 in which said higher-level analysis of health data is distributed among several computers connected via specialized computer networks, including networks for home use, work environment, hospital, and transportation.

16. (currently amended) A system as set forth in claim 7 in which said higher-level analysis of health data is distributed among several computers connected via at least one specialized computer network ~~networks~~, including networks for tracking serial changes in patients with at least one condition selected from congestive heart failure, coronary artery or ischemic heart disease, cardiac arrhythmias, hypertension, syncope, asthma, diabetes, and other illnesses.

17. (currently amended) A system as set forth in claim 7 in which said higher-level analysis of health data is integrated into an artificial intelligence

system, which ~~may include~~ includes at least one method selected from an expert system, a neural network and ~~or~~ a combination of the methods (a hybrid system).

18. (original) A system as set forth in claim 7 in which said network of computers includes at least one of a fuzzy-logic classifier and a dynamic neural network with at least one neuron (unit) for analyzing changes in at least one state of activity of at least one physiological, biological, biophysical, mechanical and genetic system relative to at least one reference value.

19. (original) A system as set forth in claim 7 in which said reference values are represented by a relation (function, distribution) between said reference values and at least one state of at least one physiological, biochemical, biophysical, mechanical, and genetic system.

20. (currently amended) A portable system for monitoring physiological or health data and analyzing the data in at least two levels of detail (or resolution) ~~for displaying changes detected in the data~~, said portable system comprising:

at least one acquisition unit for receiving physiological or health data generated by monitoring a subject for at least several seconds;

at least one analysis unit for detecting at least one of a plurality of primary elements from said signals to detect one-time changes in such primary elements and thereby identify any abnormal or unstable primary elements, storing said at least one of a plurality of primary elements, comparing at least one of said plurality of primary elements which have been stored with at least one of a plurality of primary elements newly received from said analysis ~~module~~ module and producing at least one indicator respecting any ~~both qualitative and quantitative information representing the differences in the data in low level resolution~~, and using at least one of the following methods selected from mathematical decomposition, mathematical modeling, signal processing, time-series analysis, statistical analysis and methods of

artificial intelligence to provide detailed characterization of serial changes in said abnormal or unstable primary elements in higher level resolution;

an output unit for displaying ~~qualitative information understandable by lay persons and quantitative information useful to medical professionals~~ said at least one indicator; and

a communications unit for sending data to at least one computer device ~~a network of computer devices~~ for processing, analyzing, and exchanging information between said at least one analysis unit and said at least one computer device ~~network of computer devices~~ to improve functionality of at least one of said one analysis unit.

21. (original) A portable system as set forth in claim 20 which includes multiple acquisition units connected to a network and multiple analysis units connected to a network.

22. (currently amended) A portable system as set forth in claim 20 that further includes an analysis unit for analyzing said primary elements in third level high resolution using at least one of the methods selected from mathematical decomposition, mathematical modeling, statistical analysis, signal processing, time-series analysis, and methods of artificial intelligence.

23. (currently amended) A portable system as set forth in claim 20 in which said at least one analysis unit and said network of computers analyze said data in low and higher resolution respectively to provide detailed characterization of serial changes in said abnormal or unstable primary elements using at least one of the following methods selected from orthogonal decomposition, non-orthogonal decomposition, ~~or~~ independent component analysis, mathematical modeling, statistical analysis, signal processing, time-series analysis, multidimensional scaling based on non-metric distances and mapping techniques, non-orthogonal linear mappings, nonlinear mappings and other methods, that make use of projection, re-scaling (change of variables), methods from the theories of singularities, bifurcations,

catastrophes, and dynamical systems, and other statistical estimators, ~~such as~~ linear and nonlinear correlation, analysis of variance, cluster analysis, factor analysis, canonical analysis, regression and discriminant function analyses, and probabilistic methods ~~such as~~ Bayesian probability and Mahalanobis distance, pattern recognition, fuzzy logic, neural networks, expert systems, and hybrid artificial intelligence systems.

24. (currently amended) A portable system as set forth in claim 20 in which said at least one analysis unit and said network of computers analyze at least one type of ~~other~~ physiological data selected from ~~such as~~ blood pressure, cardiac output, vascular activity, temperature, respiration, cardiac, abdominal, or breathing sounds, blood flow, hormonal concentration, enzyme and protein level, genetic, proteomic, and molecular data, neural activity, electroencephalographic activity, and other electrical, mechanic, sonic, biochemical, biophysical processes in the human body, demographic, psychological, and environmental data.

25. (original) A system as set forth in claim 20 in which said network of computers includes at least one of a fuzzy-logic classifier and a dynamic neural network with at least one neuron (unit) for analyzing changes in at least one state of activity of at least one physiological, biological, biophysical, mechanical and genetic system relative to at least one reference value.

26. (original) A system as set forth in claim 20 in which said reference values are represented by a relation (function, distribution) between said reference values and at least one state of at least one physiological, biochemical, biophysical, mechanical, and genetic system.

27. (currently amended) A system for detection of serial changes in health data and analysis of the data, said system comprising:
an implantable acquisition unit;

at least one external unit selected from a personal computer, a specialized processor, a personal digital assistant, and a computer organizer for collecting health data from a subject; said an external processing unit having wireless communication with said implantable acquisition unit;

wherein at least one of said implantable acquisition unit and said external device having the capability of detecting a plurality of primary elements from said data and processing said primary elements to generate data reference values respecting said primary elements, storing said data reference values respecting said primary elements, comparing data ~~said reference values~~ newly received by said implantable acquisition unit with at least one reference value selected from at least one of said data which has been stored (threshold data), manually adjusted threshold data and preset default reference values using at least one of the following methods selected from methods of mathematical decomposition, mathematical modeling, artificial intelligence, statistical analysis, signal processing, time-series analysis, and mathematical decomposition to generate health data of differences between said reference data and said newly received data.

28. (original) A system for detection of serial changes in health data and analysis of the data as set forth in claim 27, in which an implantable acquisition unit includes processing capability.

29. (currently amended) A system as set forth in claim 27 in which said ~~methods of~~ processing is performed using at least one method selected from orthogonal decomposition, non-orthogonal decomposition or independent component analysis, multidimensional scaling based on non-metric distances and mapping techniques, non-orthogonal linear mappings, non-linear mappings and other methods, that make use of projection, re-scaling (change of variables), methods from the theories of singularities, bifurcations, catastrophes, and dynamical systems, and other statistical estimators, linear and nonlinear correlation, analysis of variance, cluster analysis, factor analysis, canonical analysis, regression and discriminant

function analyses, and probabilistic methods, Bayesian probability and Mahalanobis distance, pattern recognition, fuzzy logic, neural networks, expert systems, and hybrid artificial intelligence systems.

30. (original) An external processing unit as set forth in claim 27 in which said communication between said at least two units is wireless.

31. (currently amended) A system as set forth in claim 27 in which said health data is selected from at least one of ~~may include~~ blood pressure, cardiac output, vascular activity, temperature, respiration, cardiac, abdominal, or breathing sounds, blood flow, hormonal concentration, enzyme and protein level, genetic, proteomic, and molecular data, neural activity, electroencephalographic activity, and other electrical, mechanic, sonic, biochemical, biophysical processes in the human body, demographic, psychological and environmental data.

32. (new) A system as set forth in claim 20 which uses at least two processes selected from electrocardiographic examination of resting electrocardiogram, stress-test, ambulatory (Holter), event, loop-recorded electrocardiogram, and processes for measuring glucose, blood pressure, cardiac output, vascular activity, temperature, respiration, cardiac, abdominal, or breathing sounds, blood flow, hormonal concentration, enzyme and protein level, genetic, proteomic, and molecular data, neural activity, electroencephalographic activity, and other electrical, mechanic, sonic, biochemical, biophysical processes in the human body, demographic, psychological and environmental data.

33. (new) A method as set forth in claim 1, in which the analysis is applied for at least one of improved detection of changes during one-time examination, assessment of short-term and long term dynamics, assessment of fitness level, disease progression, treatment, complications and side-effects control, physical examination, early detection of subtle changes, and timely initiation or adjustment of therapy, early prediction and prevention of physiological disorders and abnormalities,

comparison of the values of data obtained from individual patients against averages of values obtained from a group of patients or population of patients to facilitate analysis of individual data and to determine the values that characterize groups of patients with similar characteristics and similar disorders.

34. (new) A system for detection of serial changes as set forth in claim 7, in which at least one of first analysis and processing unit and at least one computer device for a higher resolution analysis performs at least one analysis selected from forecasting or prediction of serial changes or trends in physiological or health data, early prediction and prevention of physiological disorders and abnormalities, assessment of short-term and long term dynamics, fitness level, disease progression, treatment, complications and side-effects control, physical examination, early detection of subtle changes, timely initiation of therapy, adjustment of therapy, comparison of the values of data obtained from individual patients against values obtained from at least one of a group of patients and a population of patients to facilitate analysis of individual data and to determine the values that characterize said at least one of a group of patients and a population of patients with similar characteristics and similar disorders.

35. (new) A method as set forth in claim 1 in which said at least one reference value is selected from preset default reference values, computed reference values previously generated, and manually edited reference values.

36. (new) A system as set forth in claim 7 in which said at least one reference value is selected from preset default reference values, computed reference values previously generated, and manually edited reference values.

37. (new) A system as set forth in claim 7 in which said computer device is selected from a specialized computer, a specialized processor, a personal computer, a computer organizer (PDA), a cell phone, a smart phone, a group of

computers connected via at least one of a local network, a wireless network, and the Internet.

38. (new) A system as set forth in claim 20 in which said at least one reference value is selected from default reference values, computed reference values previously generated, and manually adjusted/edited reference values.

39. (new) A system as set forth in claim 20 in which said computer device is selected from a specialized computer, a specialized processor, a personal computer, a computer organizer (PDA), a cell phone, a smart phone, a group of computers connected via at least one of a local network, a wireless network, and the Internet.

40. (new) A system for detection of serial changes in physiological or health data and analysis in at least two levels of detail, said system comprising:

at least one acquisition unit connected to at least one computer device for collecting physiological or health data from a subject over a period of at least several seconds;

at least one first analysis and processing unit for detecting at least one of a plurality of primary elements from said data and processing said at least one of a plurality of primary element in low level resolution to generate data respecting said primary elements, and comparing at least one reference value with data newly received by said first analysis and processing unit and producing at least one type of indicator of differences between said at least one reference value and said newly received data;

at least one storage unit for storing said at least one reference value respecting said primary elements selected from among data previously generated by said at least one first analysis and processing unit (threshold values), manually adjusted threshold values, and preset default values;

a communications unit for sending data respecting at least one of said plurality of primary elements to at least one computer device for processing and detailed analysis of serial changes in at least one of the said primary elements in said data, said at least one computer device for a higher resolution analysis using at least one method analysis for assessing small changes in serial data and for exchanging information with said first analysis and processing unit to improve at least one of said low-level and higher-level resolution.

41. (new) A detection and analysis system as set forth in claim 40 in which said method of analysis by said at least one computer device uses at least one of mathematical decomposition, time-series analysis, mathematical modeling, signal processing, statistical analysis, methods of artificial intelligence, and combinations of at least two such methods.

42. (new) A detection and analysis system as set forth in claim 40 in which said at least one type of indicator is selected from qualitative indicators and quantitative data indicators.

43. (new) A system for detection of serial changes in physiological or health data and analysis in at least two levels of detail, said system comprising:

at least one acquisition unit for collecting physiological or health data from a subject over a period of at least several seconds;

at least one first analysis and processing unit for detecting at least one of a plurality of primary elements from said data and processing said at least one of a plurality of primary elements in low level resolution to generate data respecting said primary elements, and comparing data received by said first analysis and processing unit with at least one reference value to produce at least one indicator respecting any differences between said newly received data and said at least one reference value ; and

a communications unit for sending said at least one type of data selected from among said qualitative indicators, said quantitative data, said physiological data and said health data to at least one computer device for processing and detailed, higher level analysis of serial changes in at least some of the said primary elements in said data using at least one of the methods selected from mathematical decomposition, mathematical modeling, computer modeling, signal processing, time-series analysis, statistical analysis, and methods of artificial intelligence for assessing small changes in serial data and for exchanging information with said first analysis and processing unit to improve at least one of said low-level and higher-level resolution.

44. (new) A system as set forth in claim 43 that includes an output unit for displaying said at least one indicator.

45. (new) A system as set forth in claim 43 in which said computer device is selected from a specialized computer, a personal computer, a computer organizer (PDA), a cell phone, a smart phone, a group of computers connected via at least one of a local network and the Internet.

46. (new) A system as set forth in claim 43 in which said reference value is selected from at least one of qualitative indicators, qualitative values, qualitative indicators that have been manually edited, quantitative values that have been manually edited, and preset default values.